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# A Standardized Education Program on Deceased Organ and Tissue Donation for Premedical and Medical Students in Korea

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**Background.** As the imbalance in organ demand and supply is getting worse, <1000 patients waiting for organ transplants die each year in South Korea. To enhance positive attitudes to deceased organ-tissue donation through systematic education, we developed an educational program with delivery pathways for premedical and medical students. **Methods.** Online and offline self-learning educational materials on deceased organ-tissue donation were generated and posted on the Vitallink Academy YouTube site. Thirty-two pre- and 15 posteducation questionnaires were developed using a web-based survey platform, and conducted before and immediately after the education process. The education proceeded in 3 steps: (1) group study sessions on selected topics, (2) poster submissions by each group and the selection of excellent poster by the organizing committee, and (3) excellent poster presentation and questions and answers. **Results.** A total of 141 students in the first year of premedical classes at the Seoul National University College of Medicine participated in this program. Only 24.2% of responders agreed that anyone who was diagnosed with brain death should donate. The proportion of students with positive attitudes toward organ-tissue donation increased from 74.7% to 97.7% ( $P < 0.001$ ) with our education. Likewise, interest in deceased organ-tissue donation-related issues increased from 33.3% to 84.9% ( $P < 0.001$ ). The expressed willingness for organ-tissue donation also increased from 76.8% to 96.5% ( $P < 0.001$ ). The proportion of accepting brain death as the determination of death increased from 61.6% to 89.5% ( $P < 0.001$ ). Moreover, 81.4% changed their approach and planned to register with an organ donor card. **Conclusions.** In this study, significant improvements were observed in knowledge, awareness, and attitude toward organ-tissue donation with our newly developed co-participatory education program for premedical students. Hence, target-specific education can be regarded as a valuable approach to enhancing public awareness of deceased organ-tissue donation.

(*Transplantation Direct* 2024;10: e1563; doi: 10.1097/TXD.0000000000001563.) <http://links.lww.com/TXD/A596>

Organ shortage is the most pressing issue in the field of organ transplantation. The first deceased donor kidney

transplantation in Korea was performed in 1979. Since then, the waiting list and time have grown much faster than the

Received 11 April 2023. Revision received 7 October 2023.

Accepted 11 October 2023.

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The authors declare no conflicts of interest.

Supported by the Ministry of Health and Welfare government with funds to the Korean Network for Organ Sharing (KONOS) and Vitallink.

H.J.J., S.L., S.S., J.O., H.C.H., I.S.M., Y.H.K., C.A., and H.B.Y. participated in research design. H.J.J., C.A., and H.B.Y. participated in the writing of the article. S.L., S.S., B.Y., D.K., G.Y., J.B.L., S.K., J.O., H.C.H., B.P., T.L., I.S.M., Y.H.K., C.A., and H.B.Y. participated in the performance of the research and data collection. H.J.J., B.P., T.L., C.A., and H.B.Y. participated in data analysis. All authors were involved in final approval.

Supplemental digital content (SDC) is available for this article. Direct URL citations appear in the printed text, and links to the digital files are provided in the HTML text of this article on the journal's Web site ([www.transplantationdirect.com](http://www.transplantationdirect.com)).

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ISSN: 2373-8731

DOI: 10.1097/TXD.0000000000001563

capacity for organ transplantation. The Korean national database lists about 36 000 patients waiting for an organ transplant in 2020, and mortality rates reached up to 5.8 patients/day in 2019.<sup>1</sup>

Promoting deceased organ transplantation by establishing a national system represents a critical step in achieving self-sufficiency.<sup>2</sup> Korea adopted the organ transplantation law in 1999; it established a national transplantation agency (the Korean Network for Organ Sharing, 2000) and a national independent organ procurement organization (the Korea Organ Donation Agency, 2009). Meanwhile, many educational seminars and workshops for medical professionals have been offered in addition to mandatory laws reporting potential deceased donors.<sup>3</sup> As a result, a total of 1599 deceased organ transplantations have been performed from 478 deceased donors in 2020. This incidence rate of 9.23 per million population is the second highest among Asian countries, but it is very low by global standards.<sup>4</sup>

Very low rates of family consent (36.6%) have been identified as the main cause of low deceased donor rates.<sup>5</sup> Families have refused to consent mainly because of a vague fear of organ donation related to negative feelings about body damage or mutilation, fear of the actual organ procurement process, lack of information, and the inability to discuss deceased organ donation with trusted individuals.<sup>6</sup> There have been >2 dozen nongovernmental organizations (NGOs) promoting deceased organ donation using campaigns or media. The second week of September was dedicated to “National Life-sharing Week” since 2017. The Korean Society of Transplantation has been performing various activities to promote public awareness through the NGO Vitallink (<http://www.vitallink.or.kr/>). As a result, >90% of the general population have learnt about deceased organ donation.<sup>6</sup> However, registration rates for organ donor cards in Korean adults have not exceeded 3% in 2020.<sup>1</sup> It is difficult to expect in the Confucian-based Eastern society to agree to organ donation for oneself or for family members based on a limited level of understanding. It is thus essential to create a positive and decisive attitude toward organ and tissue donation. This attitude, in turn, can only be obtained with accurate knowledge and empathy for the value of life-sharing. To enhance public awareness, Vitallink has developed standardized and customized education programs for hospital staff in addition to middle and high school students to provide accurate knowledge and awareness through repeated, systematic education.<sup>3</sup>

There were several studies in the United States and Europe that evaluated medical students’ knowledge, awareness, and attitudes and performed educational interventions regarding organ donation and transplantation.<sup>7–11</sup> Especially, although Spain has one of the highest rates of organ donation in the world, it has been reported that Spanish medical students express a perceived lack of comprehensive information regarding organ donation and transplantation.<sup>11</sup> Of the students, 74% acknowledged having received information from their university professors, and only 66.7% accepted the concept of brain death as a dead people.<sup>11</sup> However, there is a lack of studies conducted in Asian countries to assess and educate medical students on organ donation and transplantation. Therefore, we have developed a co-participatory education program targeting premedical and medical students. Our education program consisted of 5 main steps: (1) generating online and offline self-learning aids materials on YouTube,

(2) developing and applying pre- and posteducation survey platforms for evaluation, (3) performing group study sessions on selected topics and submitting posters with the results of group efforts, (4) selection of excellent posters including presentation and questions and answers, and (5) evaluating educational effects with surveys. Here, we present an educational program module and results of pilot performance conducted with first year premedical students at the Seoul National University.

## MATERIALS AND METHODS

### Development of a Standardized Education Program

The organizing committee members consisted of education experts, medical students, transplantation specialists, and staff of the Vitallink. The organizing committee oversaw the development, implementation, and evaluation of the program.

### Online and Offline Self-learning Materials

Video contents have been recorded by organizing committee members and uploaded on the YouTube channel of the Vitallink Academy site ([www.youtube.com/channel/UC7nB\\_HQ1E-vj4WtqvwiZGKA](http://www.youtube.com/channel/UC7nB_HQ1E-vj4WtqvwiZGKA)) with information on: (1) What is deceased donor organ transplantation? (2) What are the current challenges in organ transplantation in Korea? (3) What is the cause of the low rate of deceased organ and tissue donation in Korea? (4) Which ethical considerations are important in organ transplantation? (5) The process of deceased donor organ donation and transplantation, (6) Difference between brain death and vegetative status, and (7) Why and how should we respect deceased organ donors and family members? Additional self-learning materials were provided, which selected from media and literature.

### Pre- and Posteducation Survey Platforms for Evaluation

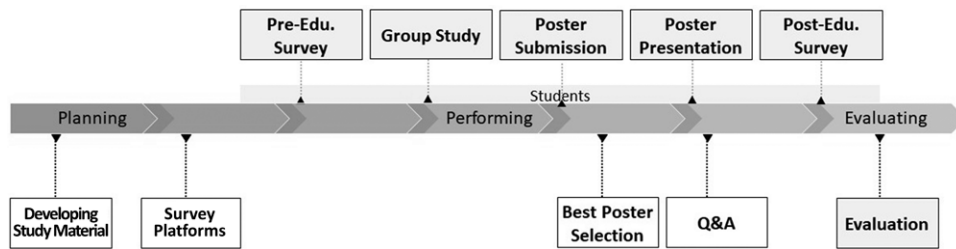
For the evaluation, pre- and posteducation questionnaires (32 and 15 questions, respectively) were developed by the organizing committee using the public survey form of the Korean Network for Organ Sharing of the Ministry of Health and Welfare, and reports from previous literature.<sup>6,12–15</sup> Those questionnaires were posted on the website provided by a professional survey company, Nextsearch. Co. (Table S1, SDC, <http://links.lww.com/TXD/A595>) The online survey was conducted before and immediately after the education, according to the Declaration of Helsinki 2000 and the Declaration of Istanbul 2018. This study was approved by the institutional review board (IRB No. 2023-03-009).

### The Process of Life-Sharing Educational Program Group Study Sessions on Selected Topics

The educational program consisted of 3 sessions (Figure 1). In the first session, students were divided into small groups (5–6 members, 20 groups), conducting a self-study and group work using materials provided to the students.

### Poster Submissions on Group Study Results and Excellent Poster Selection

Each study group prepared 1 poster on 3 topics: (1) What is a deceased organ–tissue donation, (2) What is the underlying cause for the low donation rate in Korea, and (3) How could we advance organ–tissue donation in Korea. The best posters



**FIGURE 1.** Process of co-participatory education program for deceased organ–tissue donation. Q&A, questions and answers.

and presenters were selected for each topic by the organizing committee members and video presentations to be used in the main conference were recorded in advance.

### Excellent Poster Presentation and Discussion

In the third session, an online live conference including video presentations and discussion was performed. Before and after the lecture, the previously developed web-based surveys were conducted.

### Participants

The educational program was delivered to first grade students of the premedical course at the Seoul National University College of Medicine (April 2021 to May 2021). Before starting the group study, the preeducation questionnaire using the web-based survey platform was performed and a total of 99 students completed the questionnaires. Among them, 29 (29.3%) were younger than 19 y and 70 (70.7%) were 19–29 y; 64 (64.7%) were males. After the life-sharing education conference, the posteducation survey was performed using the web-based survey platform, and 86 students completed the survey. Since the questionnaires were conducted anonymously, it was not possible to pair the participants between the pre- and posteducation survey.

### Statistical Analysis

Categorical variables were expressed as numbers or percentages (%), and continuous variables such as the Likert score were expressed as mean  $\pm$  SD in descriptive analyses. To compare the results between the pre- and posteducation questionnaire, the chi-square test for categorical variables and Student's *t* test for continuous variables were used to determine differences. Descriptive analyses were performed using Microsoft Excel (Microsoft, Inc., Redmond, WA) and other statistical analyses were conducted using R (v.4.1.0; The R Foundation for Statistical Computing, Vienna, Austria). A *P* value of  $<0.05$  was considered statistically significant.

## RESULTS

### Knowledge on Deceased Organ–Tissue Donation in Premedical School Students Before Participation

Ninety-nine students responded to the preeducation questionnaire. Among those, 96.0% said that they have heard of organ and tissue donation; 48.4% participated in a life-sharing education program provided by universities or other organizations. However, 1.1% felt that they had almost no knowledge about organ–tissue donation and 50.5% felt that they had only limited knowledge. Only 10.1% of students said that they knew someone in their family members, friends, or acquaintances

who have donated organs/tissues during brain death or received organs from a brain death donor. The vast majority of students (97.0%) were able to distinguish between brain death and vegetation state. However, to the question about more detailed information about brain death such as complete loss of brainstem reflex, absence of spontaneous breathing, temporarily maintained heartbeat, and irreversible damage to entire brain functions including the brainstem, 36.5% chose the wrong answer. In addition, in response to the question that brain death documents death, many (38.4%) were either not sure or were not aware at all. The results were summarized in Table S1 (SDC, <http://links.lww.com/TXD/A595>).

### Attitude Toward Deceased Organ–Tissue Donation Before Participating in Education

Only 33.3% of students showed interest in deceased organ/tissue donation-related issues. To the question of willingness to organ–tissue donation, 6.1%, and 17.2% answered that they are not at all or not very supportive of organ/tissue donation. Meanwhile, 18.2% were willing to, and 58.6% were somewhat willing to donate. In response to the question on why they were not willing to donate organs/tissue, 39.1% answered because of vague fear, 34.8% were reluctant to see the human corps damaged, 13.0% because there were no real experienced cases around, and 8.7% because of a lack of overall information on organ donation. Among 99 students who responded to the preeducation questionnaire, only 4.0% already had signed up for the organ donor card registration. Korea has adopted the opt-in system for deceased organ donation. When a family member becomes brain-dead, students will agree to donate if the family member registered (88.9%) or if the person expresses his wish to donate (63.6%). The results were summarized in Table S1 (SDC, <http://links.lww.com/TXD/A595>).

### Opinions About Public Awareness on Deceased Organ–Tissue Donation

Some students had access to advertisements or promotional materials related to organ/tissue donation through television (43.4%), promotion materials and posts in hospitals or public health centers (39.4%), and internet media including blogs, cafés, social network service, and YouTube (31.3%). Improvement of the courtesy for organ donors and their family members (29.3%), education activities for students of elementary, middle, high school, and university (27.8%), television programs (23.2%), and online activities (13.1%) were considered as the most efficient strategies to improve public awareness on deceased organ and tissue donation. Most students (83.8%) said that courtesy for brain death donors is necessary or very necessary, and the best way that they think was funeral support services (35.4%) and followed by the establishment of a

memorial park or memorable monument (22.2%), social-level support programs for bereaved families including transportation and education support (19.2%), and emotional support for bereaved families (15.2%). The results were summarized in Table S1 (SDC, <http://links.lww.com/TXD/A595>).

Changes in Attitude Toward Deceased Organ–Tissue Donation by the Education

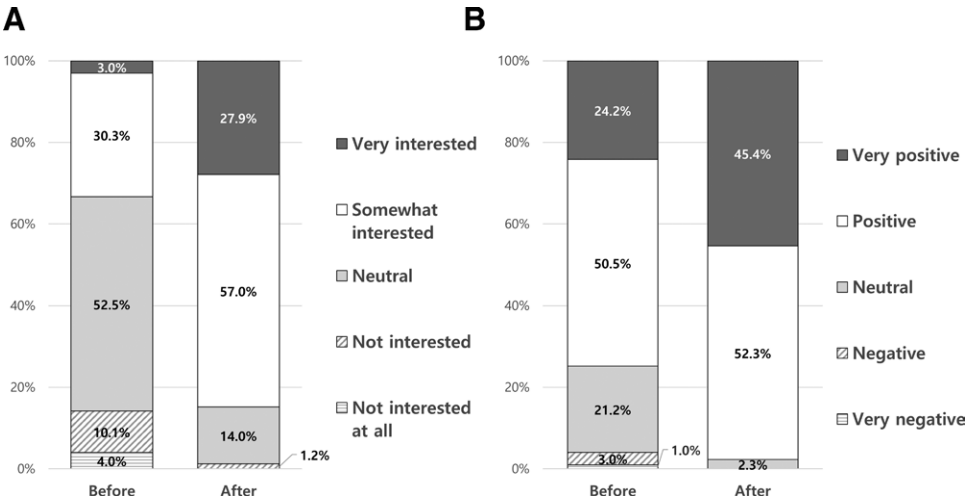
Interest in deceased organ–tissue donation-related issues increased from 33.3% (before) to 84.9% (after) the education ( $P < 0.001$ ). The mean Likert score before the education was  $3.2 \pm 0.8$  points increasing to  $4.1 \pm 0.7$  points after the education ( $P < 0.001$ ) (Figure 2A). In response to the question about a positive attitude toward organ–tissue donation, the proportion also increased from 74.7% to 97.7% ( $P < 0.001$ ). The mean Likert score before the education was  $3.9 \pm 0.8$  points, and  $4.4 \pm 0.5$  points after the education ( $P < 0.001$ ) (Figure 2B).

Before the education, 76.8% of participants answered that they are somewhat or very willing to donate organs and tissue with an increase to 96.5% after the education ( $P < 0.001$ ) (Figure 3A). After the education, 81.4% of students felt that

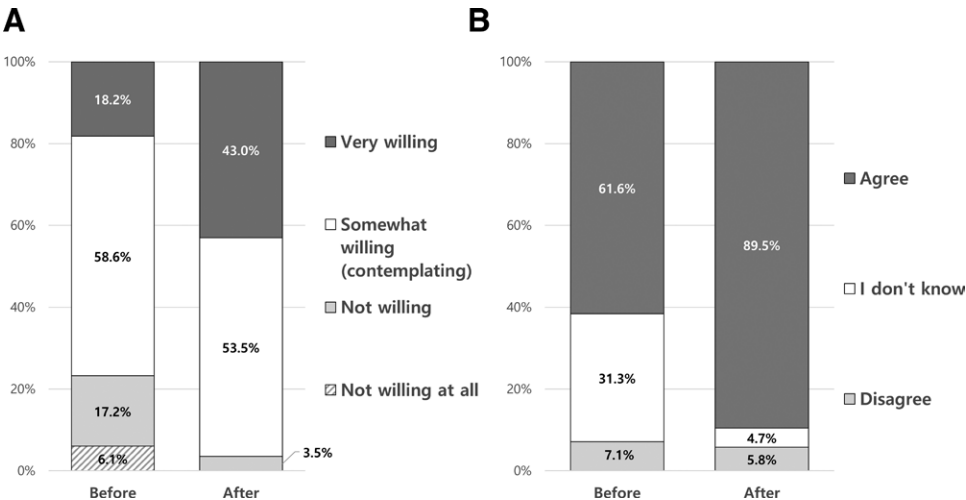
they would recommend organ and tissue donation after brain death or organ donor card registration to their family members, friends, or acquaintances, compared with 54.6% before education ( $P < 0.001$ ). The vast majority of students (97.7%) were able to clearly distinguish brain death and vegetation state at the end of the education. After the education, 89.5% of participants clearly determined brain death as death, compared with 61.6% before education ( $P < 0.001$ ) (Figure 3B). Moreover, after the education, 81.4% of students said that they had changed their mind and planned to sign up for organ donor card registration in the future. Additionally, students felt that they realized the importance of talking with their family about the life-giving potential of organ donation, learned more about the status and necessity of organ donation, and realized that organ donation is an opportunity to save a life during a sad situation.

DISCUSSION

Vitallink is a NGO founded by the Korean Society of Transplantation in 2009 to promote public awareness of deceased organ donation. Vitallink has hosted the National



**FIGURE 2.** Changes in interest and attitude toward organ/tissue donation before and after education. Assessing interest (A) and attitude (B) toward organ/tissue donation determined by Likert score before and after the educational intervention.



**FIGURE 3.** Changes in attitude toward organ/tissue donation before and after education. (A) Willingness to organ/tissue donation and (B) acceptance of brain death as death determination before and after the educational intervention.



Assembly Policy Seminars, hospital and public campaigns, and transplantation sports games, in addition to conducting education on donation and transplantation for students. In Korea, many governmental and NGOs have provided life-sharing campaigns during the last 20 y; however, most of those activities were 1-time, appealing to emotions, promotional events that lacked consistency and expertise. As a result, public awareness of deceased organ donation remained at a level of vague knowledge.<sup>16</sup>

Education plays a pivotal role in increasing the number of deceased donors and organ donor card holders.<sup>12,13,17-22</sup> Education for young people can provide sufficient knowledge to change their attitudes. It also can be spread from students to family members through the “let family members know my wish campaign,”<sup>23</sup> as well as to teachers, and colleagues. The 2021, the organ and tissue donation promotion plan announced by the Korean Ministry of Health and Welfare also emphasized on the importance of education. Several education programs aimed at high school students have been implemented to increase awareness and understanding of organ donation.<sup>21,24</sup> Recently, Steenaert et al<sup>14,25,26</sup> designed an interactive program that included video segments, quizzes, and group discussions, targeting low-educated students in intermediate vocational schools. The effectiveness of the program was evaluated using 25 questions from Google Analytics. However, there is currently a gap in the availability of programs for medical or premedical students who may be involved in the process of brain-dead organ donation in the future. Accordingly, the Vitallink Education Committee has developed target-specific educational programs for premedical and medical students through the processes.

Medical schools usually have included education for organ donation and transplantation in the curriculum as a part of surgical, bioethical, or intensive care unit lectures, and in-depth exposure can be provided only to few students through elective courses. Our education program is the first program in Asia, tailored to the college student stage, and different from previously implemented ones from the following points of view. First, our program used YouTube, which is very familiar to this age group and has the advantage of being able to access educational content online anytime and anywhere. Second, rather than the previous lecture-style education method, the active learning system such as self-study and group work for preparing poster presentations before the lecture was adopted to induce active participation of students and to make it an interactive education. Third, using a web-based survey platform, which was created for use in Asian medical students, accessibility, and statistical processing were improved to evaluate the changes in students' awareness, attitude, and knowledge before and after education. Additionally, this program can be applied to other university students including medical students. Lastly, another feature is that it follows the online program format. Of course, this is because the program was first applied during the COVID-19 pandemic, but as the online program is becoming an important teaching tool in many universities, this will be applicable not only to universities in Korea but also to Asian regions with similar cultures.

During active learning, students perform learning in advance using learning materials such as online video contents uploaded by instructors outside the classroom before a lecture, and student-centered learning activities such as discussion and team activities are performed inside the classroom. During

conference time, a traditional lecture is replaced by interactive learning, including presentations, group discussions, and questions and answers between students and instructors.<sup>27</sup> The flipped classroom model is an emerging teaching and learning method and had been widely used in medical education in recent years.<sup>28</sup> The idea of the flipped classroom is known to not only effectively utilize limited time but also improve learning outcomes.<sup>29,30</sup> Similarly in our study, flipped learning method could lead to significant improvements in knowledge and awareness about life-sharing as well as positive attitudes toward organ and tissue donation in a limited time. To the best of our knowledge, it is the first article to report the application of flipped learning to life-sharing education.

This study had several limitations. First, the number of freshmen at medical schools in Korea is about 3200 a year, and participating students in the premedical course at the Seoul National University College of Medicine may not be representative. Second, of the 141 students who participated in this education, only 99 responded to the questionnaire, because they were asked to fill out the questionnaire on the premise of anonymity. However, if anonymity had not been guaranteed, the answers to the questionnaire may have been different. Third, if there were matched Likert scores before and after the education of the same student, the significance of the educational effect could be tested using a paired *t* test or a 2-way contingency table, but such analyses were not possible due to the anonymity of the questionnaire. Fourth, due to the time constraints of the medical school curriculum, only 1-time life-sharing education was allocated. However, to overcome the time constraints, self-study, and group work for preparing poster presentations before the lecture was performed. In the long term, re-education is necessary when they become medical personnel and apply it to clinical practice. In addition, through additional analysis of negative answers, it is necessary to supplement the reinforcement education for the missing parts and to diversify the format of the program and diversify the group. However, since the program was developed for medical students, there are some limitations to its application to other groups, and the program may require much time and resource investment.

Before education, 96.0% of students said that they have heard of organ and tissue donation, however, only 2.1% said that they know about organ-tissue donation very well. That is consistent with the previous result of 97.5% in the report, which had investigated the public knowledge in the general population.<sup>6</sup> That means, students had basic knowledge about brain death, but only 61.6% of them recognized brain death as death, and their awareness of the importance of life-giving and saving through organ donation was low. Students showed a limited interest in deceased organ and tissue donation, low intention to donate, and had a low sense of duty, and it was confirmed that the actual organ donation registration rate among them was very low at 4%. In the general population, the main cause of the nonwillingness to organ donation was a concern of body damage or mutilation (44.2%) followed by a vague fear of the actual organ procurement process (23.4%), lack of information (16.8%), and a lack of experience (10.4%).<sup>6</sup> That is similar to our survey results that the main cause of not being willing to organ donation was vague fear (39.1%) and reluctance to accept damaging the human body (34.8%).

Through this program, students could acquire knowledge about brain death and fully understand the transparency of

the organ donation process. It was possible to reduce vague feelings of rejection or anxiety against deceased organ-tissue donation and successfully draw empathy for the value of life-sharing. As a result, students attained much higher positive interest (33.3%–84.9%), increased their willingness to donate (76.8%–96.5%), decided to register for donor card (81.4%), and increased their sense of duty to participate in life-sharing movement (8.1%–81.4%).

In conclusion, this study showed significant improvements in knowledge and awareness sufficient to bring about changes in attitude toward organ-tissue donation when we applied our newly developed co-participatory education program to a group of premedical students. Hence, target-specific education can be regarded as a valuable approach to enhancing public awareness of deceased organ-tissue donation. The online survey platform provided not only a tool for evaluating the effectiveness of the education program but also valuable information about the level of public awareness of university freshmen. This online program can be used in other Asian countries where it is culturally too early to accept deceased organ donation since this issue is still very sensitive and difficult to discuss openly as a high school curriculum. By making the information readily accessible and convenient, it can also offer a solution for addressing the lack of information and understanding about organ donation for medical and premedical students in those countries.

## ACKNOWLEDGMENTS

We would like to acknowledge officers of Vitallink for their excellent secretarial support. We are greatly appreciative to all participants, deceased donors, and their family members.

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